

SECTION 230
CULVERTS, STORM DRAINS AND
SEWER PIPES

DESCRIPTION

230.20 General.

This work shall consist of the construction of culvert storm drains, sewer pipes, hereinafter referred to as "Pipe", and flared end sections for Reinforced Concrete or Metal Pipe, in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

MATERIALS

230.40 General.

Materials shall meet the requirements specified in the following Subsections of Division III, Materials:

Corrugated Metal Pipe	M5.03.0
Asphalt Coated Corrugated Metal Pipe Arch	M5.04.0
Corrugated Metal Pipe (Aluminum)	M5.03.3
Asphalt Coated Smooth Steel Liner Helically Corrugated Shell Metal Pipe	M5.04.3
Cement Concrete Pipe	M5.02.0
Clay Pipe	M5.01.0
Reinforced Concrete Pipe	M5.02.1
Ductile Iron Pipe	M5.05.3
Structural Plate for Pipe and Pipe-Arch	M5.04.2
Jointing Materials for Pipe	M9.10.0
Mortar for Pipe Joints	M4.02.15
Reinforced Concrete Pipe, Flared Ends	M5.02.2
Metal End Sections	M5.03.6
Polymeric Precoated Corrugated Metal Pipe	M5.03.8
Corrugated Plastic (Polyethylene) Pipe	M5.03.10

CONSTRUCTION METHODS

230.60 General.

Excavation (See Subsection 140.60).

230.61 Bedding Pipes.

The bedding for the pipe shall be shaped to conform reasonably close to the lower 10% of the pipe and recesses excavated for bells of bell and spigot pipes.

All pipe shall be laid to the specified line and grade, with a firm bearing throughout each length and with bell ends uphill.

230.62 Pipe Joints.

The joints of clay, cement concrete and reinforced concrete pipe, shall be formed by caulking into the ball a

gasket of jute or oakum and then filling the remainder of the joint with cement mortar. The invert shall be kept smooth and free of any obstructions. In the case of concrete pipe the surfaces to be joined shall be thoroughly cleaned and wetted with water before the joint is made. Corrugated metal pipe and corrugated plastic (polyethylene) pipe shall be firmly joined with an approved coupling.

When rubber type ring gaskets are used the pipe ends shall be designed so that the gasket will be confined on all sides and will not support the weight of the pipe. Regardless of the type of joint used the interior surfaces of abutting pipes shall form a smooth grade when pipe laying is completed.

Where water tight joints are required respective pipes shall be joined as follows:

Clay pipe shall employ a compression joint consisting of a plastic material applied to the bell and spigot ends of the pipe and a compression ring of elastomeric material conforming to ASTM C 425, Type III.

Cement concrete or reinforced cement concrete pipe shall be joined using flexible water tight rubber gaskets conforming to ASTM C 443. Any alternative joint design must be pre-approved by the Department's Research and Materials Engineer.

In designated areas, as directed, certain joints may be left open to allow for entrance of underground water into the pipe line.

230.63 Structural Plate Pipe and Pipe-Arch.

A. Excavation. (See Subsection 140.60.)

B. Bedding.

The pipe or pipe-arch structure shall be placed on a prepared foundation carefully shaped to fit the lower plate or plates of the structure so that the flow line will conform to the required grade.

The arch structure shall be placed on a foundation as shown on the plans. Each side of the arch shall rest on a galvanized channel, as detailed on the plans, securely embedded in the substructure.

C. Erections.

The plates for the structure shall be assembled according to the manufacturer's assembly instruction. Pipe or pipe-arch structures may be assembled in their final location or adjacent to it, and then placed on the prepared foundation as a complete unit. Arches shall be erected in place upon the prepared substructure. When completed, all bolts shall be effectively tightened.

D. Elongation of Pipe.

All pipe shall be fabricated elliptically so as to increase the vertical diameter 5 percent and decrease the horizontal diameter 5 percent. These dimensions shall be subject to manufacturing tolerances.

E. Coating.

The entire outside surface and the inside bottom half of the pipes and the entire outside and inside of the bottom and corner plates of pipe arches shall be covered with a coat of bituminous material conforming to Subsection M7.04.01 of Division III, Materials.

When the structure is erected in the final location, the bottom of all plates that are to be in contact with the ground shall be coated and allowed to dry before they are placed in the structure.

For arches, the entire outside surface shall be covered with one coat of bituminous material as specified above. The metal bearing channel shall be filled with an approved asphalt filler to the level of the concrete after erection of the arch and before backfilling is started.

F. Backfilling.

Backfilling requirements shall conform to the provisions of Subsections 120.60B, 150.60 and 150.64.

G. Flared End Sections.

The unit shall be accurately aligned on a prepared bed on the existing ground, or if so directed by the Engineer, on compacted gravel fill.

COMPENSATION

230.80 Method of Measurement.

A. Pipes shall be measured in place and the quantity to be paid for shall be the length actually constructed as directed within the limits specified below.

For measurement purposes the end of pipe in closed structures shall be considered at the inside face of the wall and at masonry headwalls it shall be considered to be at the face of the headwall.

Pipe bends for Corrugated Metal pipe shall be in accordance with current Standard Construction Drawings and the length of pipe sections containing bends shall be measured along the centerline and shall be paid for as straight sections of pipe.

Reinforced Concrete Pipe Flared Ends and Metal End Sections will be measured in place by the unit each, complete and approved.

Trench excavation in excess of 1.5 meters and rock excavation shall be measured as specified in Subsection 140.80 for Class B Trench Excavation and Class B Rock Excavation respectively.

B. Structural plate pipe or pipe arches shall be measured in place and the quantity to be paid for shall be the length actually constructed as directed and to the following limits:

For structural plate pipe the length shall be the average of the top and bottom center line length; for pipe arches, the bottom center line length; and for arches, the average of the springing line lengths.

Trench Excavation in excess of 1.5 meters and Rock Excavation for structural plate pipe, arches and pipe arches shall be measured in accordance with the relevant provisions of Subsection 140.80 for Class B Trench Excavation and Class B Rock Excavation.

230.81 Basis of Payments.

Pipe culverts, pipe drains and pipe sewers will be paid for at the contract unit price per meter of the kind of pipe required, installed and complete in place.

Reinforced Concrete Pipe Flared Ends and Metal End Sections will be paid for at the contract unit price each for the size and kind of pipe end specified.

Trench excavation for pipe culverts, pipe drains, pipe sewers, structural plate pipe arches and pipe arches greater than a depth of 1.5 meters and rock excavation will be paid for as specified in Subsection 140.81 for Class B Trench Excavation and Class B Rock Excavation. No payment for trench excavation for pipes will be made within the limits of 300 millimeters outside the base section of catch basins, manholes or leaching basins.

Backfill for trenches 1.5 meters or less in depth for pipe culverts, pipe drains, structural plate pipe arches and pipe arches and pipe sewers shall be included in the various items of pipe. Backfill for that part of a trench which is more than 1.5 meters in depth shall be included in the item for Class B Trench Excavation. If the material for backfill is obtained from borrow it will be paid for at the contract unit price per cubic meter or metric ton of the kind of borrow required.

Masonry ends and foundations will be paid for at the contract unit price per cubic meter of the kind of masonry required.

Gravel Borrow will be paid in accordance with Subsection 150.80.

230.82 Payment Items.

230.*	___ millimeter Corrugated Metal Pipe, ___ micrometer	Meter
230.7.*	___ millimeter Corrugated Metal Pipe End Section, ___ micrometer	Each
231.*	___ millimeter Corrugated Metal Pipe (Aluminum) ___ micrometer	Meter
231.6*	___ millimeter Asphalt Smooth Steel Linear	Meter
	Helically Corrugated Steel Metal Pipe, ___ micrometer (of outer shell)	Meter
231.7.*	___ millimeter Corrugated Metal Pipe (Aluminum) End Section, ___ micrometer	Each
232.*	Asphalt Coated Corrugated Metal Pipe-Arch, ___ micrometer	Meter
233.*	Cement Concrete Pipe	Meter
234.*	___ millimeter Drainage Pipe-Option	Meter
238.*	Ductile Iron Pipe	Meter
239.*	Structural Plate Pipe	Meter
240.*	Structural Plate Pipe-Arch, ___ micrometer	Meter
241.*	___ millimeter Reinforced Concrete Pipe	Meter
to 245.*		
241.1.*	___ millimeter Reinforced Concrete Pipe, Flared End	Each

to 245.1*		
252.-*	___ millimeter Corrugated Plastic (Polyethylene) Pipe	Meter
255.*	Polymeric Precoated Corrugated Metal Pipe	Meter
256.*	___ millimeter Polyethylene Pipe	Meter
142.	Class B Trench Excavation	Cubic Meter
144.	Class B Rock Excavation	Cubic Meter
151.	Gravel Borrow	Cubic Meter
156.	Crushed Stone for Drainage Foundation	Metric Ton
903.	20 MPa - 40 mm - 280 kg Cement Concrete Masonry	Cubic Meter
685.	Field Stone Masonry in Cement Mortar	Cubic Meter

*Pipe or appurtenance size will be included as part of the item number in order to differentiate between the sizes.

SECTION 258

STONE FOR PIPE ENDS

DESCRIPTION

258.20 General.

Stone for pipe ends shall consist of a protective covering of angular shaped stones laid on slopes in front of and around drainage ends to insure protection of the pipe ends and the embankment and shall conform to the Department Standard "Stone for Pipe Ends".

MATERIAL

258.40 General.

Stone for pipe ends shall comply with the provisions of Subsection M2.02.3.

CONSTRUCTION METHODS

258.60 General.

The stone shall be placed to line and grade as shown on the plans or as directed on a prepared bed of embankment material or existing materials. Each stone shall be carefully placed by hand, normal to the slope and firmly bedded thereon. The larger stones shall be placed directly at the drainage end to prevent erosion and displacement. Each stone shall have a mass of not less than 25 kilograms nor more than 60 kilograms and at least 75% of the volume shall consist of stones having a mass of not less than 35 kilograms each. The remainder of the stones shall be so graded that when placed with the larger stones, the entire mass will be impacted with a minimum percentage of voids and minimum thickness of 150 millimeters.

COMPENSATION

258.80 Method of Measurement.

Stone for pipe ends will be measured in place by the square meter. No allowance will be made beyond the dimensions indicated or as directed.

258.81 Basis of Payment.